CATERPILLAR

SERVICE MANUAL

308C MINI HYD EXCAVATOR

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UENR3262 Seal Installation 1128

FINNING CAT

Service Information System

Shutdown SIS

Previous Screen

Product: NO EQUIPMENT SELECTED
Model: NO EQUIPMENT SELECTED
Configuration: NO EQUIPMENT SELECTED

General Service Information
4M40 DIESEL ENGINE SHOP MANUAL

Media Number -KENR5078-00 **Publication Date -01/11/2007** **Date Updated -01/12/2014**

KENR50780006

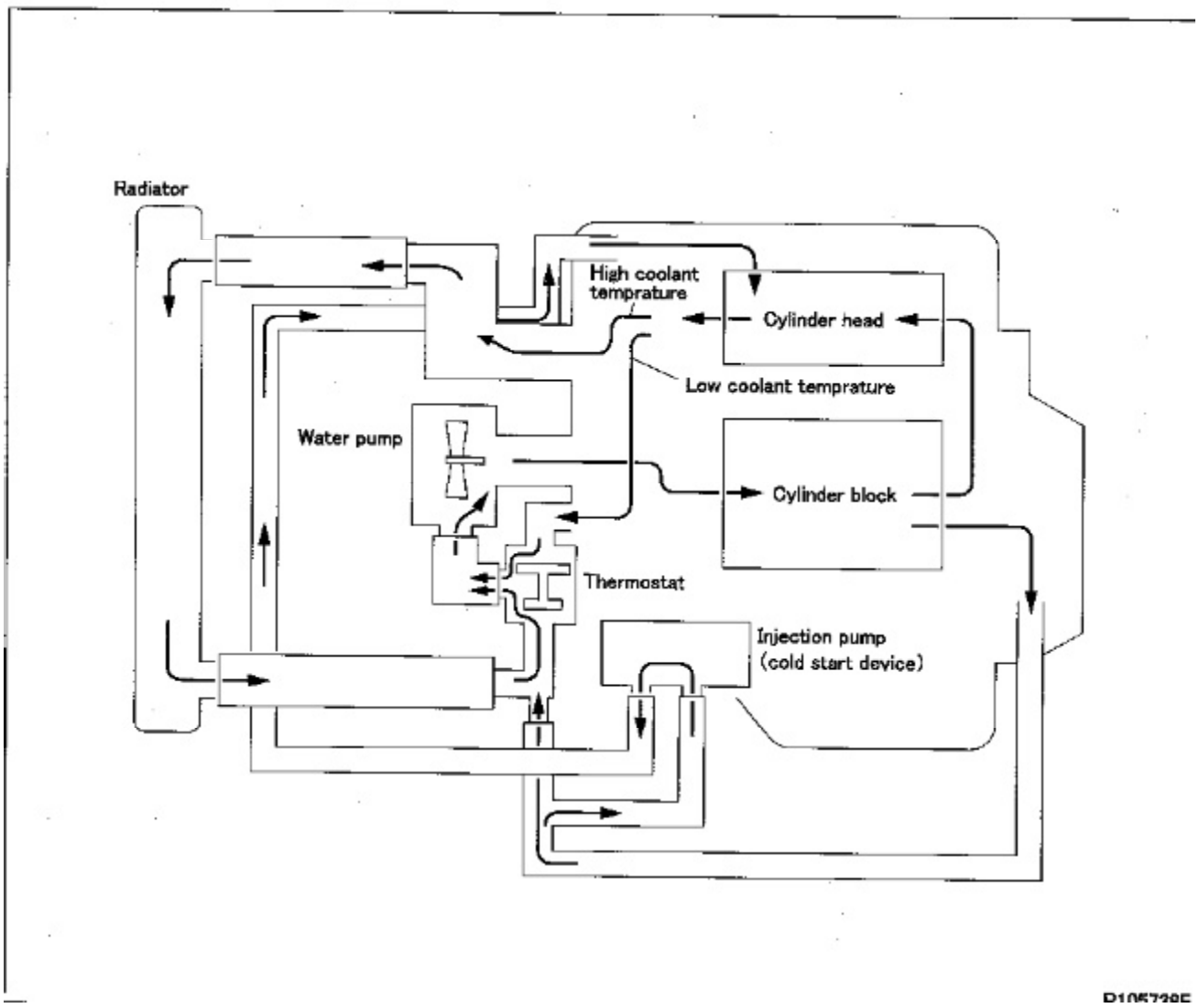
Cooling

Specifications

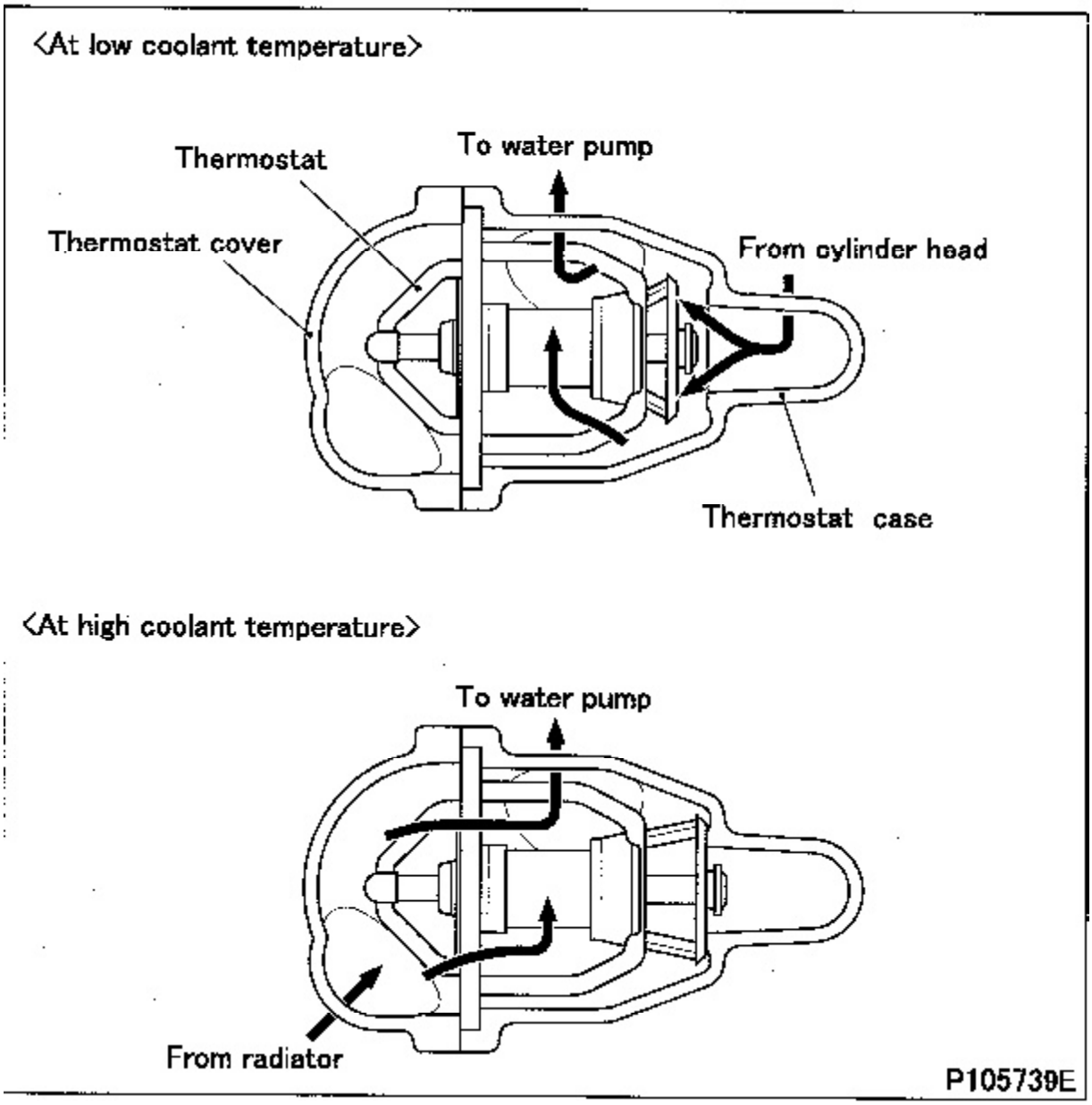
Item	Specifications
Cooling system	Forced water circulation system
Water pump	Belt-driven involute type
Thermostat	Wax pellet, bottom bypass type (with jiggle valve)

Structure And Operation

Cooling System (Flow of Coolant)

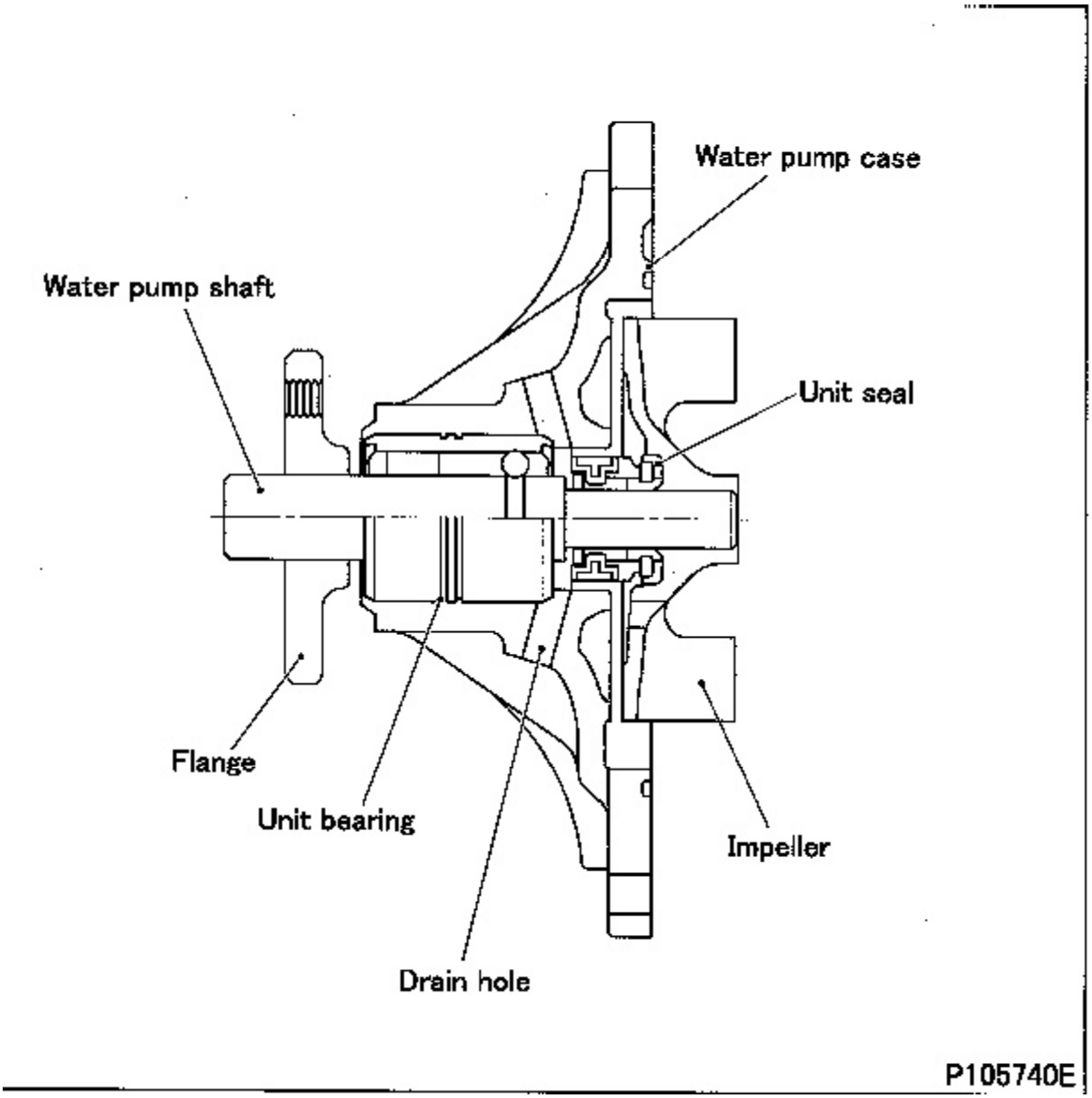


Thermostat



***** The thermostat is a bottom bypass type that uses a wax-filled pellet as its flow-regulating element. When the wax is heated, it melts from solid to liquid, changing its total volume. This allows the valve to open or close in accordance with the coolant temperature, regulating and adjusting the flow of coolant to the radiator and to the cylinder head (bypassing the radiator).

Water Pump



***** The water pump has a drain hole to prevent coolant from entering the unit bearing in the case of defect of the unit seal.

This is the sample of the manual click on the download link for complete manual

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Troubleshooting

Possible causes / Symptoms		Overheating (poor cooling)	Overcooling	Abnormal noise	Excessive coolant loss	Reference Gr
Belt	Loose or damaged	O		O		
	Excessive tension			O		
	Oil on belt	O				
Water pump	Incorrectly mounted water pump	O			O	
	Defective gasket	O			O	
	Defective unit bearing	O		O		
	Defective impeller	O				
	Defective unit seal	O			O	
	Too loose fit of unit bearing on flange and impeller	O		O		
Thermostat	Incorrectly mounted case	O			O	
	Defective gasket	O			O	
	Valve opening temperature too high (valve remains closed)	O				
	Valve opening temperature too low (valve remains open)		O			
	Leakage from coolant temperature sensor	O			O	
Oil cooler	Incorrectly mounted oil cooler	O			O	Gr12
	Defective gasket	O			O	
Cylinder head	Incorrectly mounted cylinder head	O			O	Gr11
	Defective gasket	O			O	
	Leakage from coolant temperature sensor	O			O	
Insufficient coolant amount		O				
Clogged or scaled coolant passage		O				
Incorrectly connected hoses		O			O	
Excessively low exterior temperature			O			

General Inspection And Adjustment

Inspection And Adjustment Of Belt Tension

WARNING

CAUTION ⚠

*** Make sure that there is no oil or grease on the belts. Belts soiled with oil or grease may easily slip, resulting in deteriorated performance of the cooling system.**
*** The water pump pulley is driven by two belts. Always replace the two belts simultaneously to ensure that both belts have the same tension.**

Service Standards (Unit: mm)

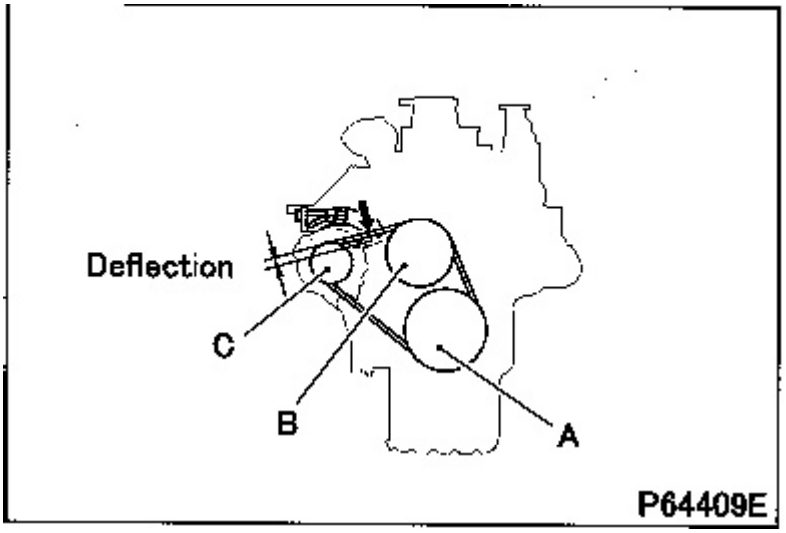
Location	Maintenance item		Standard value	Limit	Remedy
–	Belt tension (for one belt)	When belt is new	10 to 11	–	Adjust
		When belt in use is re-tensioned	8 to 9	–	Adjust

Special Tools

Mark	Tool name and shape	Part No.	Application
(a)	Belt tension gauge P03612	MH062345	Measurement of tension of belt

Inspection and Cleaning Procedure

Inspection: Tension of belts

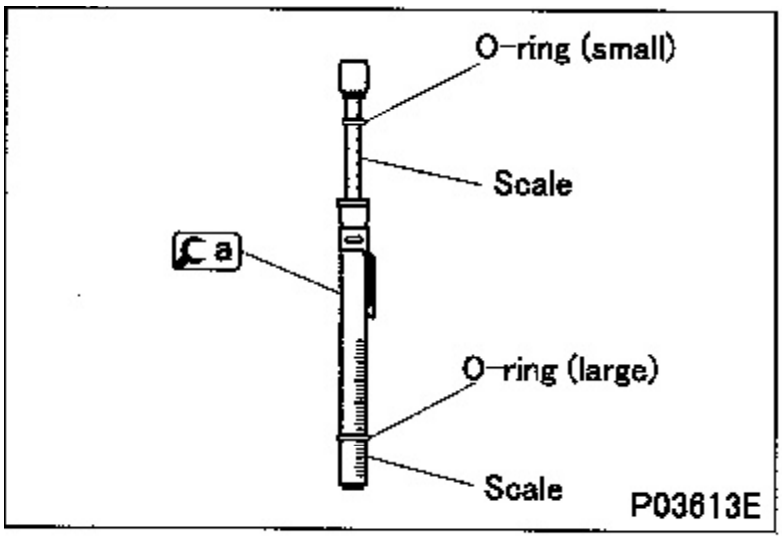


***** Press each belt at a central portion between pulleys with a force of approximately 98 N {10 kgf} as shown in the illustration and measure the amount of deflection of the belt.

A: Crankshaft pulley
B: Water pump pulley
C: Alternator pulley

***** Place the small O-ring on

at the scale mark corresponding to 98N {10 kgf} (press force).

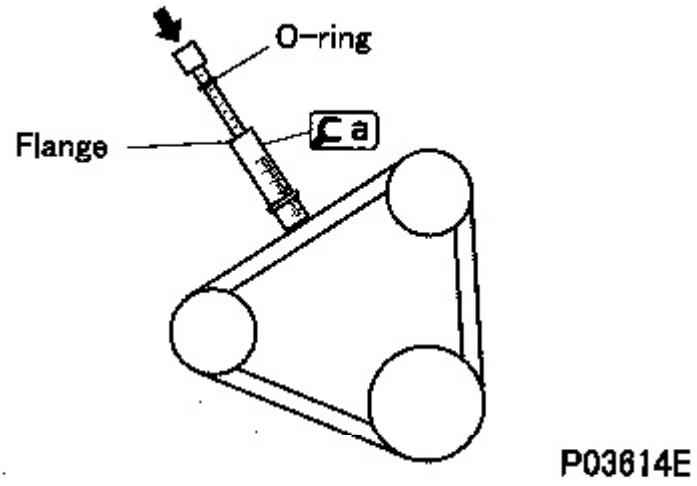


***** Place the large O-ring on

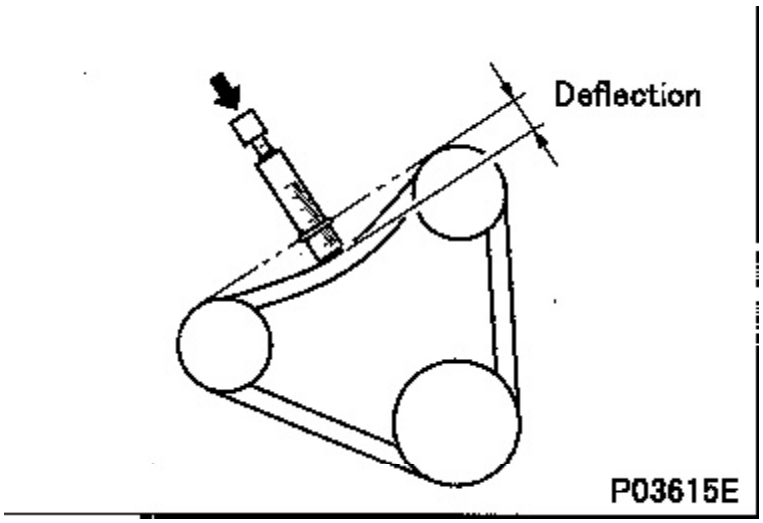
at the scale mark corresponding to the maximum permissible deflection value specified for the belt.

***** Place

at a central portion between pulleys of the belt and push the handle (indicated by the arrow in the illustration) until the O-ring touches the flange.

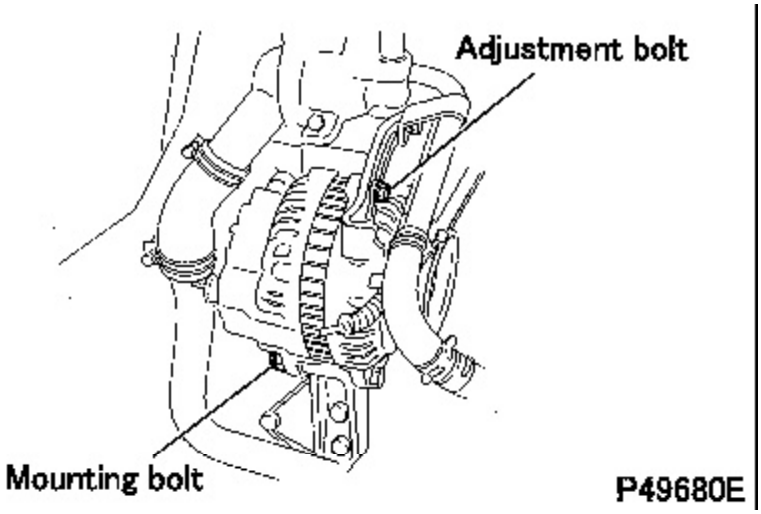


***Measure the amount of deflection of the belt.**



***** If the measured value deviates from the standard value range, adjust the tension of the belt as follows.

Adjustment of belts



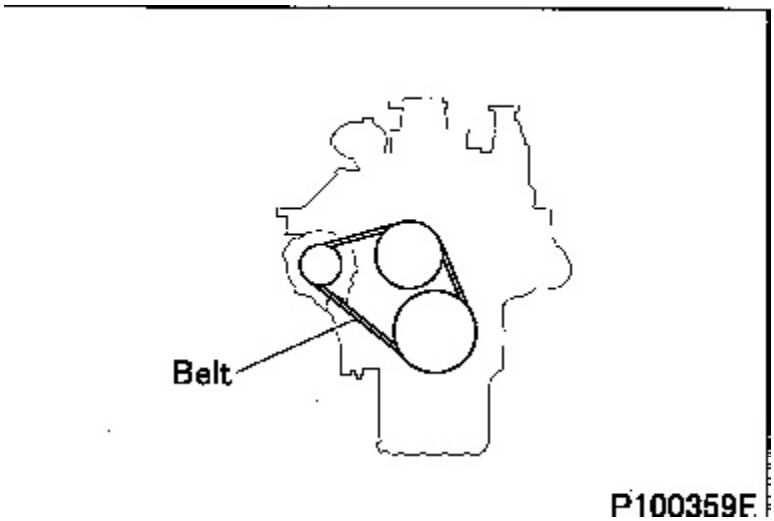
***** Loosen the alternator mounting bolt, and adjust the tension of the belt by moving the alternator as required.
***** After the adjustment is completed, retighten the mounting bolt firmly.

WARNING

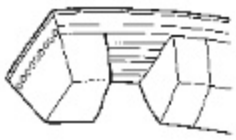
CAUTION

*** Excessive tension in the belt may damage not only the belt itself but also the bearings of the related components.**

Inspection of Belts



* Visually check the belts for possible cracks and damage. Belt replacement time varies depending on the severity of cracks and damage that may be found through the check. Study the table given below for the applicable replacement time.

Belt condition	Remaining service life (reference)
Wrinkled P69698E	• The driving distance over the which the belt can still be used is at least as long as that over which the belt has been used since the vehicle was new or since the belt was replaced (whichever is more recent).
Cracks on belt surface P69699E	• The driving distance over the which the belt can still be used is about half of that over which the belt has been used since the vehicle was new or since the belt was replaced (whichever is more recent).
Cracks extending to base rubber P69700E	• The driving distance over the which the belt can still be used is about a quarter of that over which the belt has been used since the vehicle was new or since the belt was replaced (whichever is more recent).
Cracks extending to cords P69701E  P69702	• The belt has reached the end of its service life and must be replaced.

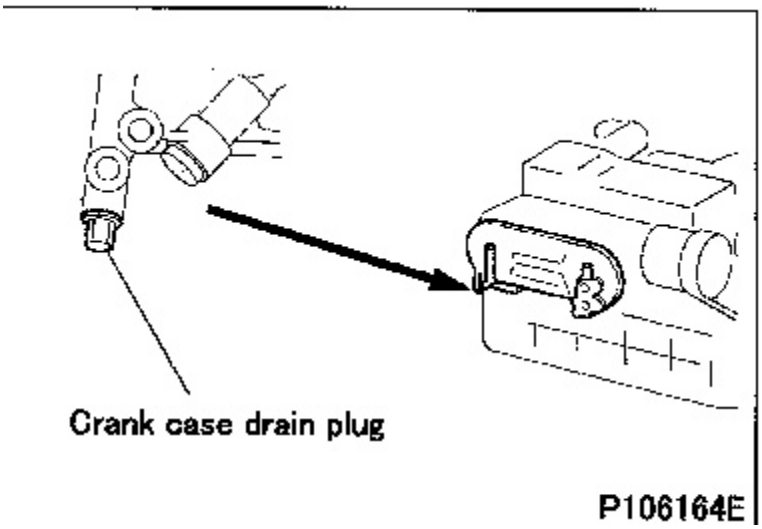
Coolant Replacement and Cleaning of Cooling System

Tightening Torque (Unit: N·m {kgf·m})

Mark	Parts to be tightened	Tightening torque	Remarks
–	Crank case drain plug	29 {3}	–

***** Using the radiator for extended periods of time without cleaning can increase chance of rust and scale formation, which may cause engine overheating. The cooling system must be cleaned periodically.

Draining of Coolant



***** Opening the pressure cap while the coolant temperature is still high can cause hot coolant to spray out. Cover the pressure cap with a cloth, and loosen it slowly to let the pressure out before opening it fully.

WARNING

WARNING

*** Drain the coolant only after it has cooled sufficiently to avoid getting scalded.**

Cleaning Procedure

***** Keep the coolant temperature at approximately 90°C so that the thermostat valve remains open and the coolant continues to circulate in the radiator.
***** For the sake of convenience you can raise the coolant temperature quickly by covering the front of the radiator with corrugated cardboard or something similar.

***** Set the temperature adjusting lever of the heat controller at maximum so that the coolant can circulate freely in the heater piping area.
***** In cases where a great amount of rust has accumulated it often happens that as a result of cleaning the radiator starts leaking. Conduct a thorough check for leakage after cleaning.
***** Soft water to be used should have the following properties.

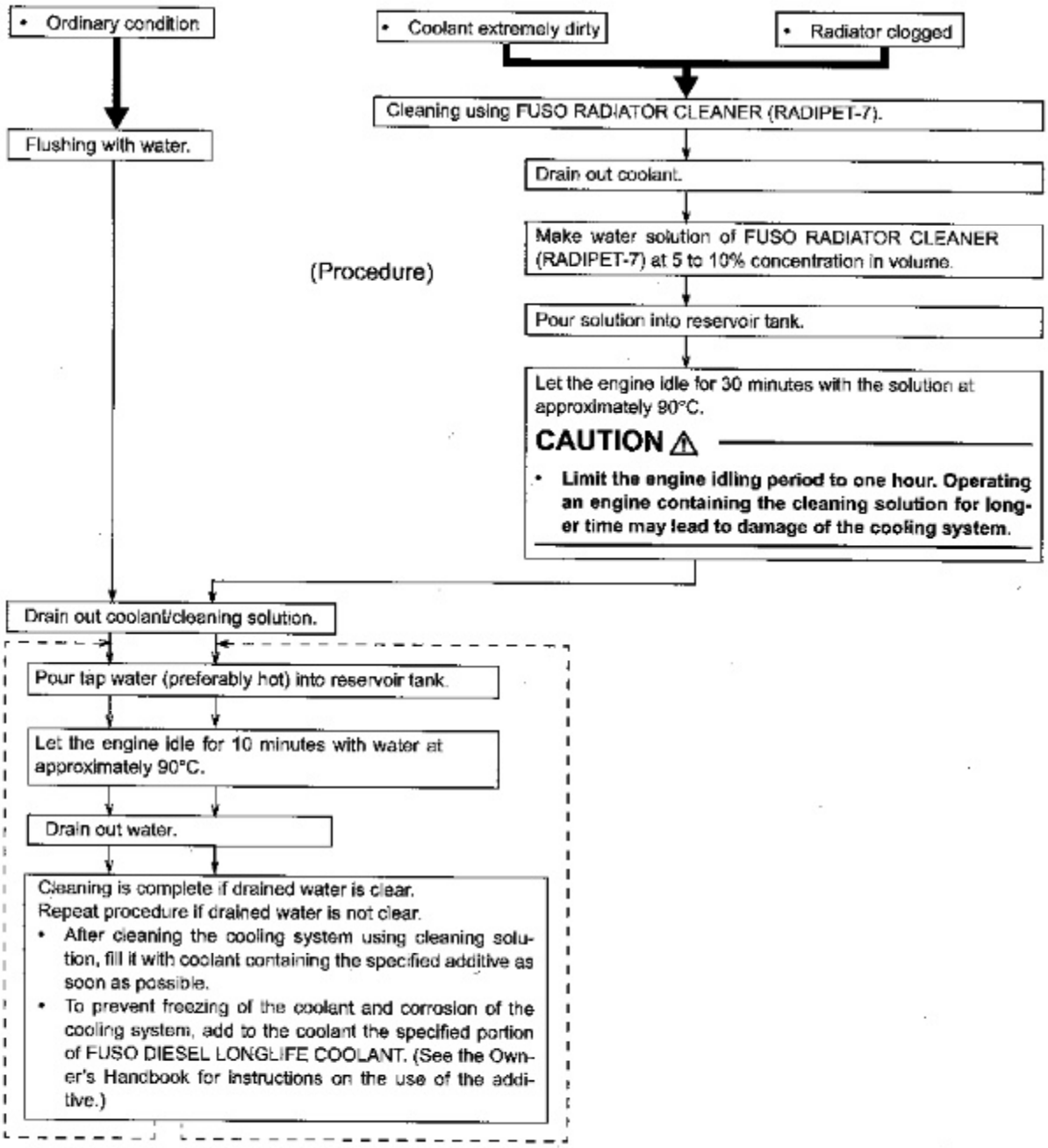
⚠ WARNING

CAUTION ⚠

*** Do not use hard water as it causes scale and rust.**

Total hardness	300 ppm or less
Sulfate SO_4^-	100 ppm or less
Chloride Cl^-	100 ppm or less
Total dissolved solids	500 ppm or less
pH	6 to 8

***** Select an appropriate cleaning method according to the condition of the cooling system as shown below.


• Ordinary condition
• Coolant extremely dirty
• Radiator clogged
Flushing with water.
Cleaning using FUSO RADIATOR CLEANER (RADIPET-7).
Drain out coolant.
(Procedure)
Make water solution of FUSO RADIATOR CLEANER (RADIPET-7) at 5 to 10% concentration in volume.
Pour solution into reservoir tank.
Let the engine idle for 30 minutes with the solution at approximately 90°C.
CAUTION
• Limit the engine idling period to one hour. Operating an engine containing the cleaning solution for longer time may lead to damage of the cooling system.
Drain out coolant/cleaning solution.
Pour tap water (preferably hot) into reservoir tank.
Let the engine idle for 10 minutes with water at approximately 90°C.
Drain out water.
Cleaning is complete if drained water is clear.
Repeat procedure if drained water is not clear.
• After cleaning the cooling system using cleaning solution, fill it with coolant containing the specified additive as soon as possible.
• To prevent freezing of the coolant and corrosion of the cooling system, add to the coolant the specified portion of FUSO DIESEL LONGLIFE COOLANT. (See the Owner's Handbook for instructions on the use of the additive.)

WARNING

WARNING

*** FUSO DIESEL LONGLIFE COOLANT is flammable. Keep them away from heat and flames.**

WARNING

CAUTION

*** If you accidentally splash FUSO DIESEL LONGLIFE COOLANT, FUSO ANTIFREEZE, OR RADIATOR ANTIRUST (RADIPET 9) in your eyes, wash it out immediately with water and seek medical attention.**

Air Bleeding of Cooling System

***** With the pressure cap removed and the coolant temperature at 90°C, let the engine idle in order to bleed air completely out of the cooling system.
***** After air bleeding is completed, refill the reservoir tank with coolant as needed.

Air/Gas Leakage Test

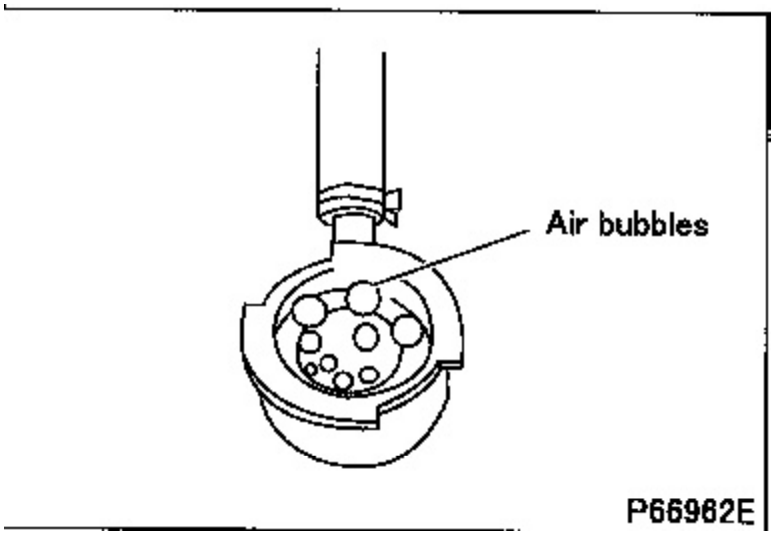
***** Presence of air or exhaust gas in coolant accelerates corrosion of the cooling system components. To prevent this, carry out air/gas leakage tests in accordance with the following procedure.
***** Remove the pressure cap.

WARNING

WARNING

*** If the engine is hot, boiling coolant may spurt out from the filler port when the pressure cap is loosened. To avoid being scold, make sure to remove the pressure cap only when the coolant is cold.**

***** Run the engine until the coolant temperature rises to approximately 90°C.



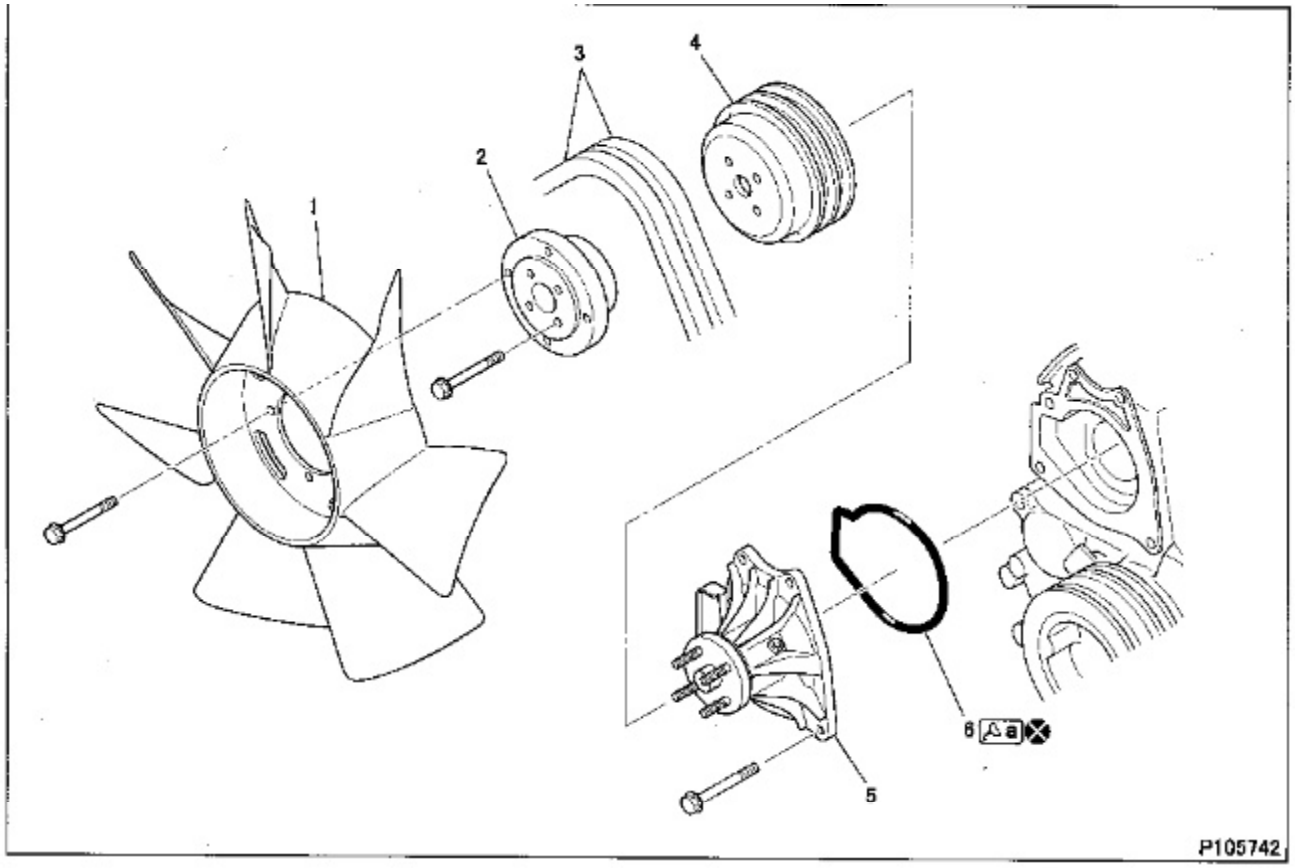
***** If air bubbles appear continuously through the filler port, there is air or exhaust gas penetrating into the cooling system.
***** Presence of air in coolant can be an indication of loose cylinder head bolts, loose water pump mounting bolts, loose hose connections, and/or a damaged hose.
***** Presence of exhaust gas in coolant can be an indication of a damaged cylinder head gasket and/or cracks in the cylinder head.

Inspection of Coolant Leak

***** With the engine idling, check the coolant passage (radiator hose, water hose, etc.) for coolant leak.
***** If any leak is found, check the installation condition of each part and retighten the loose part to the specified torque.

If any crack or damage is found on a pipe or hose, replace it to a new one.

Coolant Fan, Belt And Water Pump



Removal Sequence

1 Cooling fan
2 Fan spacer
3 Belt
4 Water pump pulley
5 Water pump
6 O-ring
X: Non-reusable parts

***** The water pump cannot be disassembled. It must be replaced if defective.

Installation Sequence

Follow the removal sequence in reverse.

WARNING

CAUTION ⚠

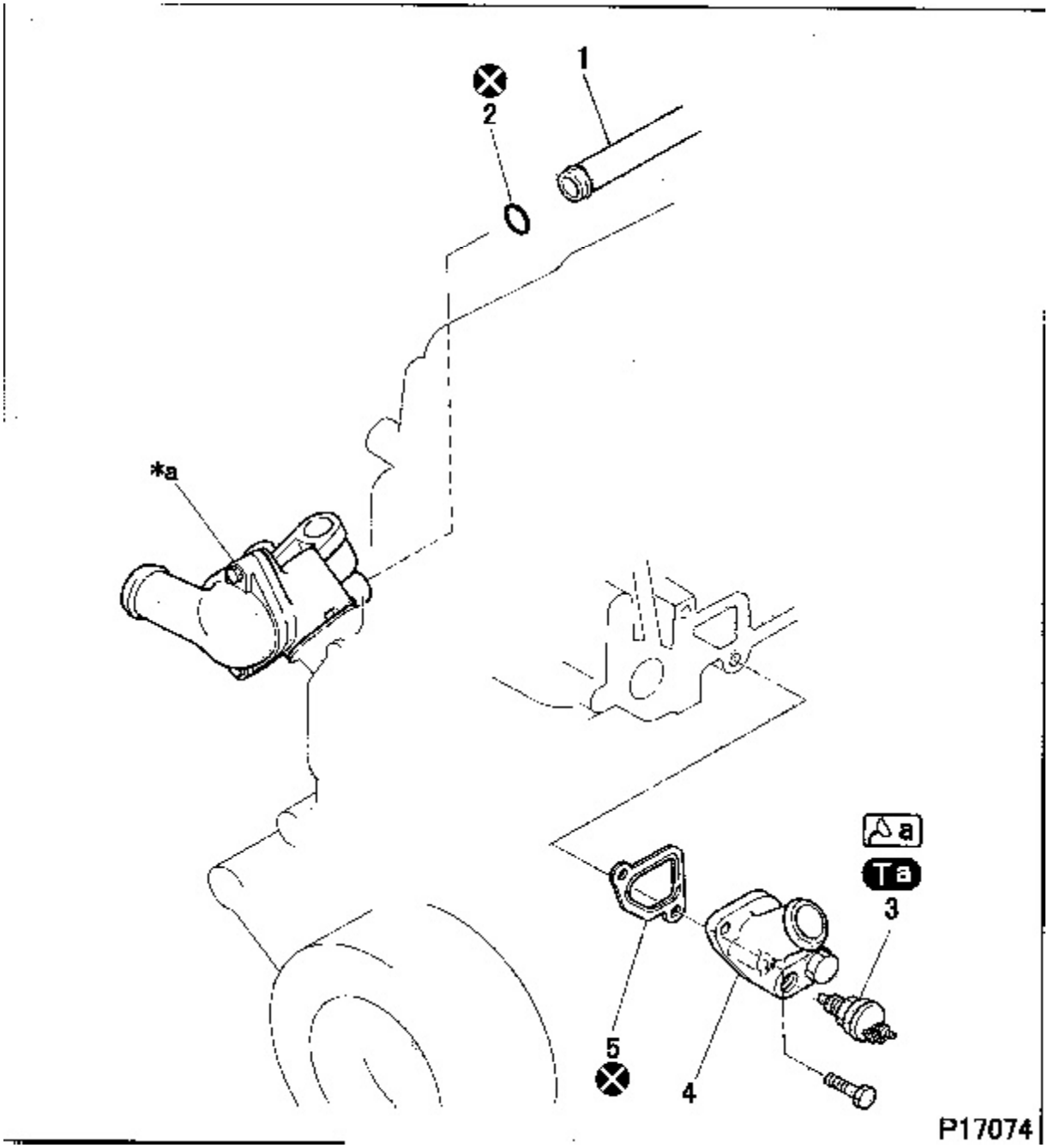
*** The water pump pulley is driven by two belts. Always replace the two belts simultaneously to ensure that both belts have the same tension.**
*** Make sure that there is no oil or grease on the belts. Belts soiled with oil or grease may easily slip, resulting in deteriorated performance of the cooling system.**
*** Keep the O-ring free from engine oil. Engine oil will make the O -ring swell, which may cause leakage.**

***** After installation, check and adjust the belt tension. (See "GENERAL INSPECTION AND ADJUSTMENT".)

Lubricant and/or sealant

Mark	Points of application	Specified lubricant and/or sealant	Quantity
a	O-ring	Soapy water	As required

Water Hose And Pipe



Disassembly Sequence

1 Heater return pipe
2 O-ring
3 Water temperature sensor
4 Water outlet pipe
5 Gasket
***a:** Thermostat case
X: Non-reusable parts

Assembly Sequence

Follow the disassembly sequence in reverse.

WARNING

CAUTION

*** Keep the O-ring free of engine oil. Engine oil will make the O-ring swell, which may cause leakage.**

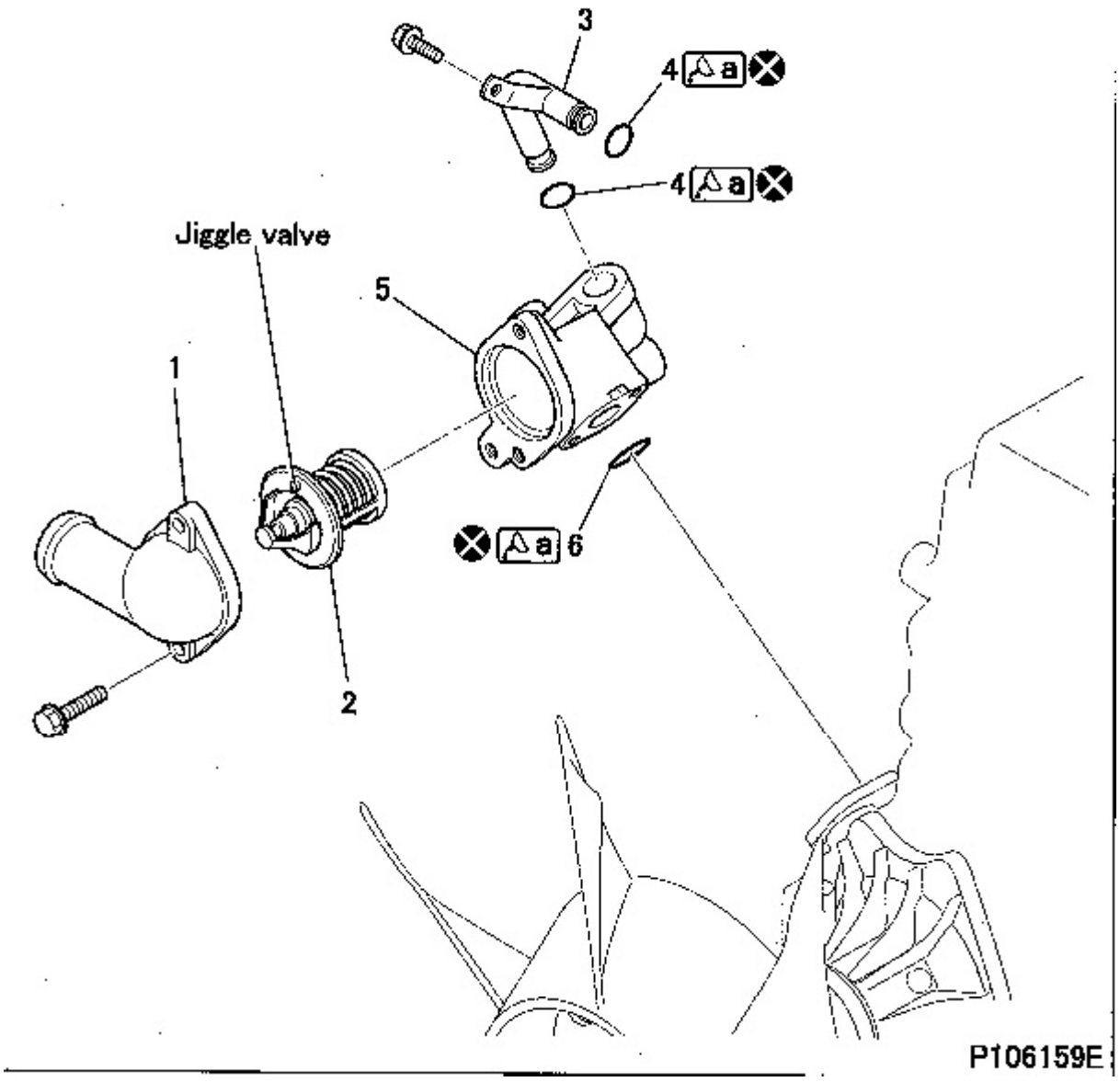
Tightening Torque (Unit: N·m {kgf·m})

Mark	Parts to be tightened	Tightening torque	Remarks
Ta	Water temperature sensor	23 ± 3.9 {2.3 ± 0.4}	–

Lubricant and/or sealant

Mark	Points of application	Specified lubricant and/or sealant	Quantity
a	Water temperature sensor threads	ThreeBond 1211	As required

Thermostat



Disassembly Sequence

1 Thermostat cover
2 Thermostat
3 Bypass Pipe
4 O-ring
5 Thermostat case
6: O-ring
X: Non-reusable parts

Assembly Sequence

Follow the disassembly sequence in reverse.

⚠ WARNING

CAUTION ⚠

*** Keep the O-ring free of engine oil. Engine oil will make the O-ring swell, which may cause leakage.**

***** Install the thermostat with the jiggle valve on the top.

Service standards (Unit: mm)

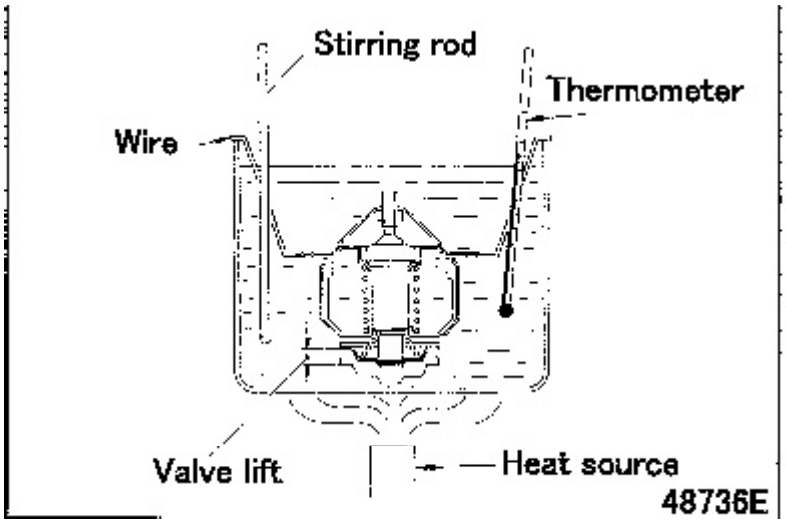
Location	Maintenance item		Standard value	Limit	Remedy
2	Thermostat	Valve opening temperature	76.5 ± 2°C	–	Replace
		Valve lift / temperature	8.5 or more / 90°C	–	Replace

Lubricant and/or sealant

Mark	Points of application	Specified lubricant and/or sealant	Quantity
a	O-ring	Soapy water	As required

Inspection Procedure

Inspection: Thermostat



***** Stir the water using a stirring rod to maintain an even water temperature in the container, then conduct the tests indicated below.
***** If the measured values deviate from the standard value ranges, replace the thermostat.

(1) Valve opening temperature

***** Hold the thermostat with wire to keep it away from the heat source.
***** Heat the water gradually to the valve opening temperature.
***** Maintain this temperature for five minutes and make sure that the valve is completely open.
***** Make sure that the valve closes completely when the water temperature drops below 65°C.

(2) Valve lift

***** Heat the water to a temperature slightly higher than the valve operating temperature. Maintain this temperature for five minutes and measure the valve lift.

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FINNING CAT

Service Information System

Shutdown SIS

Previous Screen

Product: NO EQUIPMENT SELECTED
Model: NO EQUIPMENT SELECTED
Configuration: NO EQUIPMENT SELECTED

General Service Information

4M40 DIESEL ENGINE SHOP MANUAL

Media Number -KENR5078-00 **Publication Date -01/11/2007** **Date Updated -01/12/2014**

KENR50780008

Electrical

Specifications

Alternator

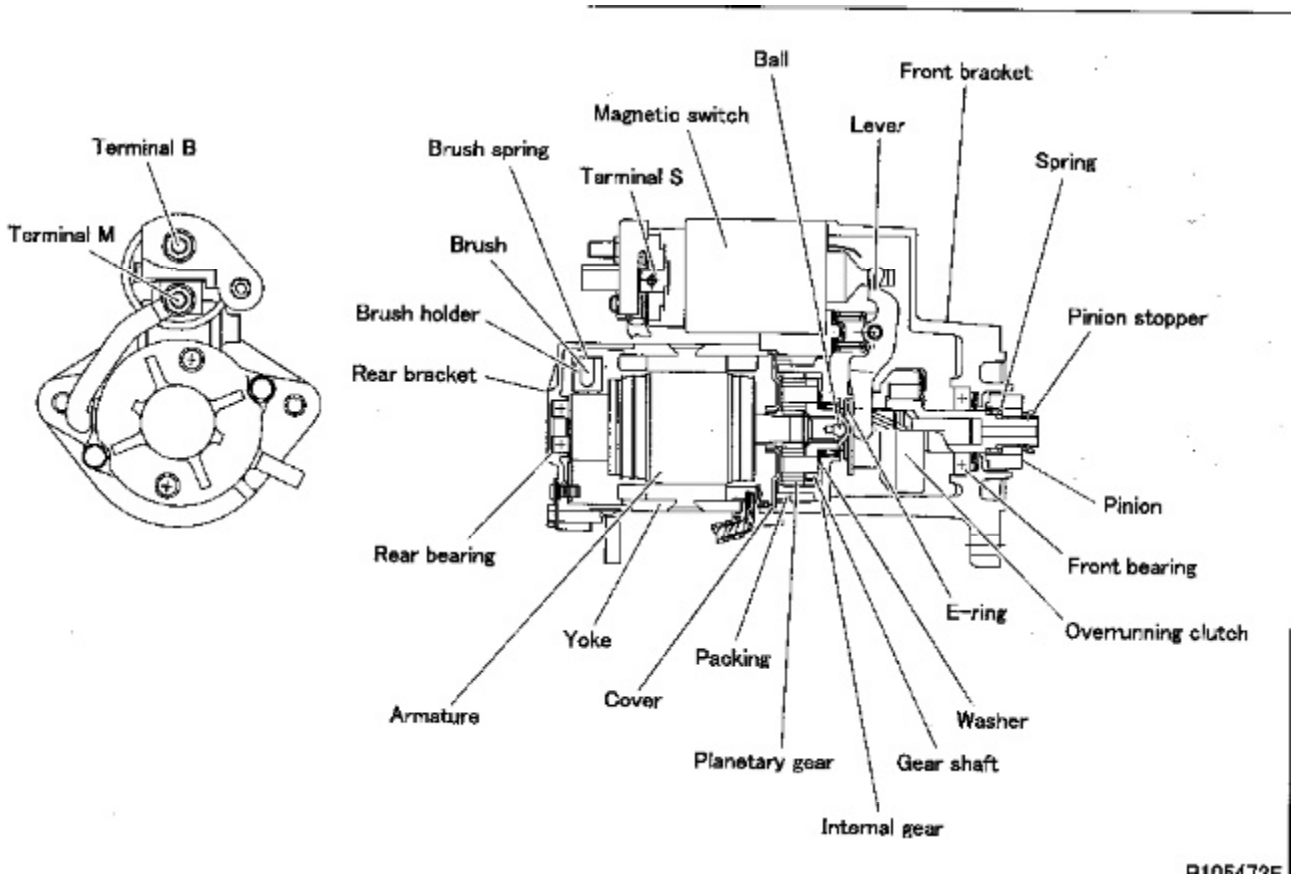
Item		Specifications
Manufacturer		MITSUBISHI ELECTRIC
Type		Alternator with built-in regulator (with brush internal fan)
Model		A3TA8199
Output	V–A	24–35

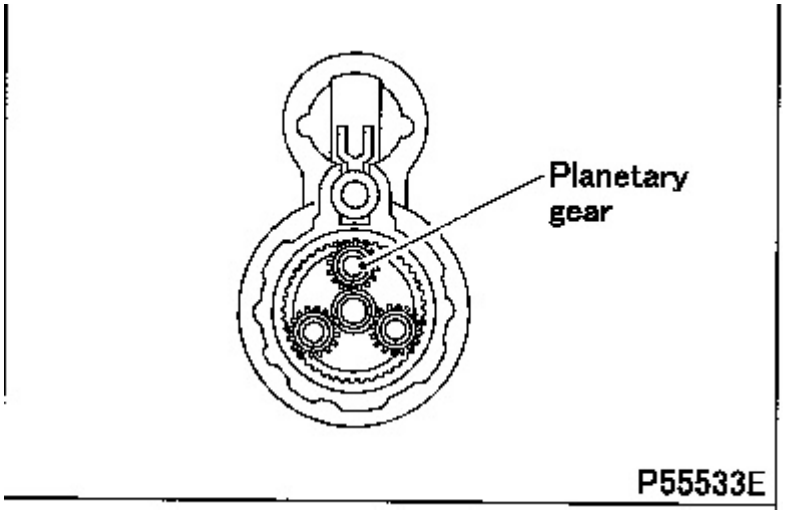
Starter, Preheat

Item			Specifications
Starter	Manufacturer		MITSUBISHI ELECTRIC
	Model		M008T80472A
	Output	V–kW	24–3.2
	Magnetic switch operating voltage	V	16 or less
Starter relay	Model		U001T47074
	Excitation current	V–A	24–2.3
	Closing voltage	V	16 or less
	Opening voltage	V	4 or less
	Allowable cutoff current	A	200
Glow plug	Model		Sheathed type
	Rated voltage and current	V–A	23–3 (reference)
Safety relay	Model		R008T30170

Structure And Operation

Starter

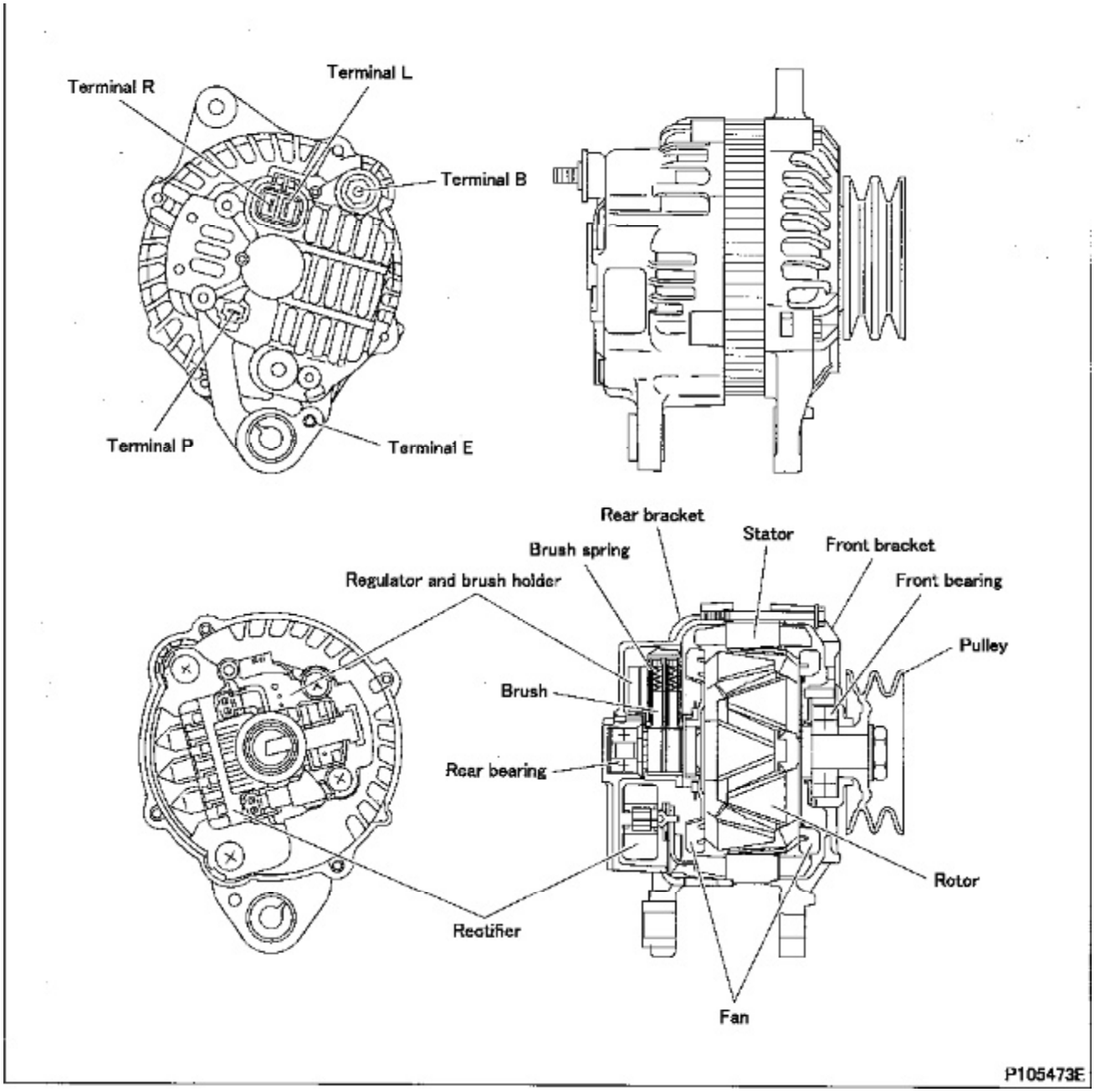




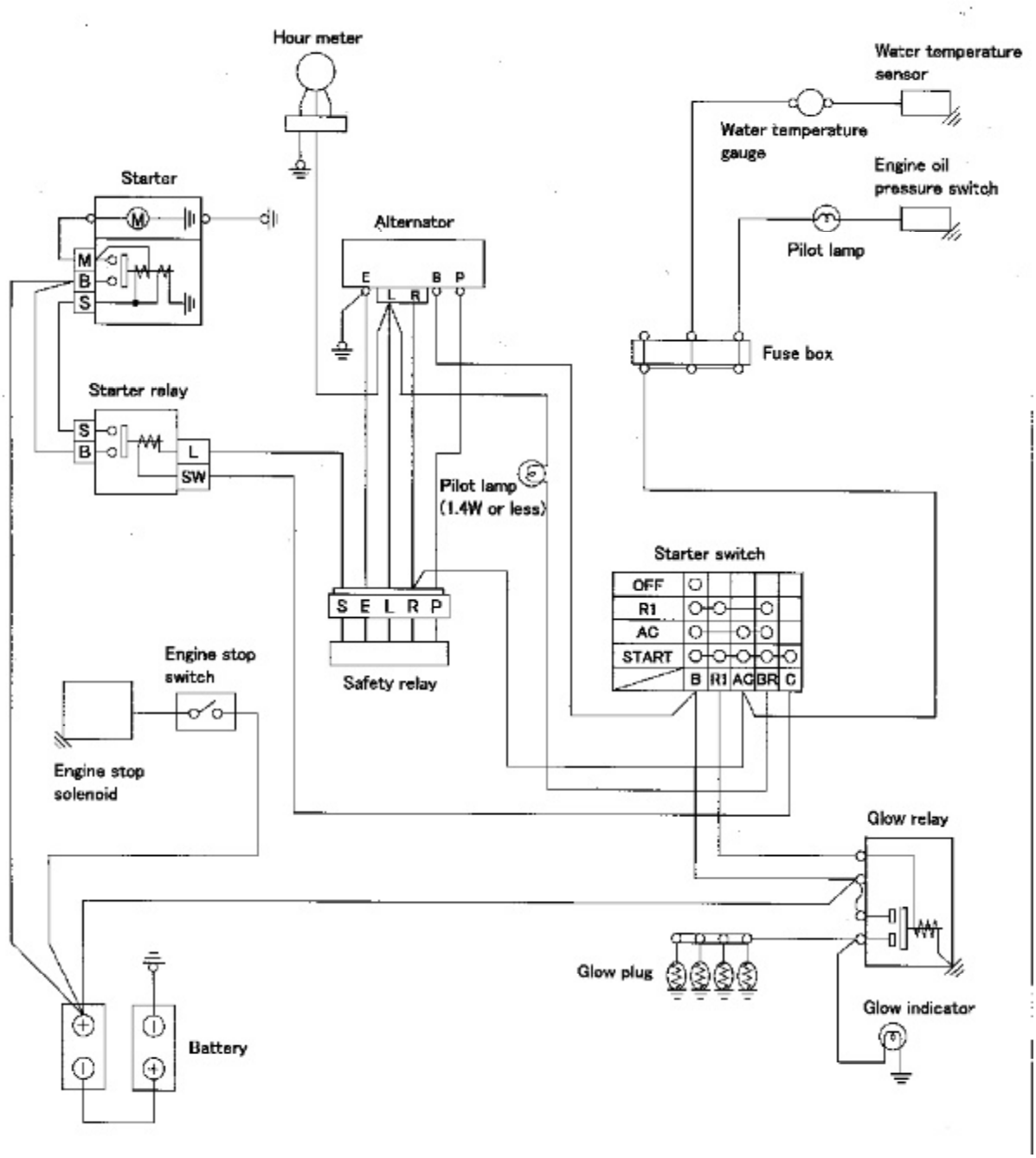
***** This starter uses planetary gears as its reduction gearing mechanism.

Alternator

<24V-35A>


Terminal R
Terminal L
Terminal B
Terminal P
Terminal E
Rear bracket
Stator
Front bracket
Brush spring
Regulator and brush holder
Front bearing
Pulley
Brush
Rear bearing
Rotor
Rectifier
Fan
P105473E

Circuit Diagram



Troubleshooting

Power And Charging

Symptoms / Possible causes		Battery electrolyte decreases too early.	Battery overheating.	Battery is normal but over-discharged.	Charge warning lamp does not light when starter switch is turned ON, with engine stopped.	Alternator is normal but battery over-discharged.	Reference Gr
Connector connection faulty, harness broken, grounding faulty				O		O	
Fuse blown				O	O	O	
Belts loose				O		O	Gr14
Belts damaged				O		O	
Battery faulty		O				O	
Alternator	Stator coil broken			O			
	Stator coil short-circuited with core			O			
	Field coil broken			O			
	Rectifier faulty			O			
	Regulator faulty		O	O	O		
	Brush worn			O			
	Brush spring fatigued			O			
	Wiring faulty			O			

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